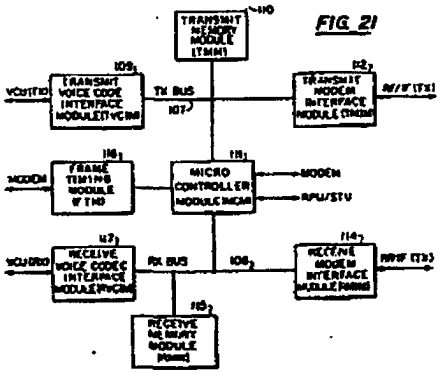
> voice channels. Each channel pair contains a series-connected combination of a VCU 17, a CCU 18 and a modem 19.

(Col. 8, lines 33-48) A far more detailed description, however, appears at column 48, lines 35 *et seq.* That description is lengthy and detailed. Accordingly, that description will not be reproduced here, except for the following excerpts.

The specification explains that the CCU (1) "performs similar functions in both the subscriber stations and the base station," and (2) performs many functions pertaining to the information formatting and timing associated with operation on the time-division transmission channels." (Col. 48, lines 36-44) The specification further explains that the CCU has both a hardware component and a software component: "The hardware used in the two station types for the CCU function is, in fact, identical. The software in the subscriber station differs slightly from that in the base station." (Col. 48, lines 38-41)

Fig. 21 is described as a "block diagram of the CCU:"



(Col. 49, line 20) According to the specification, inputs to the CCU come from four sources:

> First, there is the actual digitized samples which are to be transmitted. These are transferred to the CCU 18, 29 from the VCU 17, 29. (FIGS. 2 and 3.) * * * Four channels may be processed concurrently by the CCU 18 when operating in the base station with all four 16-level PSK transmission channels operating. * * * The second input to the CCU comes via the baseband control channel (BCC) from the STU 27 (in the subscriber station) or the RPU 20 (in the base station). This second input provides control messages pertaining to modes of operation, status and control information. * * * The third input source provides timing and status information from the modem 19, 30a. * * * The fourth input source is the

> actual modem data received as symbols of up to four bits each (depending on the modulation levels). These symbols are buffered, demulitplexed and output to the VCU 17, 28 receive circuit for decoding.

(Col. 48, line 44-col. 49, line 19) The specification also explains that the "architecture of the CCU is essentially that of two one-way direct memory access (DMA) data channels with an intelligent microprocessor controller," and that the "function of the DMA channels is to transfer data from the VCU to the modem and vice versa." (Col. 49, lines 20-25)

As shown in the above Fig. 21, the CCU is illustrated and described as having a TX (transmit) bus 107 "for the transmit channel (VCU to CCU to modem) and a RX [receive] bus 108 for the receive channel (modem to CCU to VCU)." (Col. 49, lines 25-29) The specification further explains that:

> Data processed by the transmit circuits in the VCU is buffered in the VCU memory until the CCU requests a DMA transfer. Forty-one bytes are transferred to the CCU during each block transfer period. Two of these blocks are transmitted per active voice channel (up to four voice channels in the base station) per TDMA frame. The CCU receives these transmit bytes via a transmit voice codec interface module (TVCIM) 109 and buffers them in a transmit memory module (TMM) 110. Depending on the specific mode of operation for the given channel, a CCU processor embodied in a microcontroller module (MCM) 111 appends a control/sync header to the coded voice bytes, thereby formatting a complete voice packet for transmission to the modem via a transmit modem interface module 112. The MCM 111 maintains frame timing information and transfers the data to the modem at the proper time.

(Col. 49, lines 29-46) That will be explained further in conjunction with Figs. 19A and 19B below.

Fig. 22 is described as showing "the software-implemented functional architecture of the CCU:"

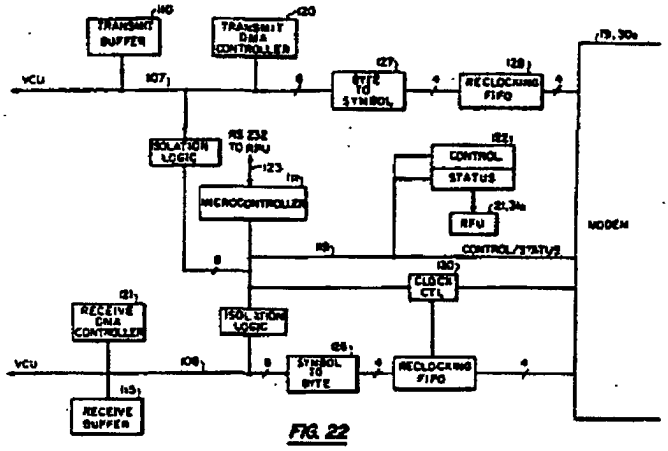


FIG. 22

(Col. 50, lines 14-15) The specification explains, in part, that:

> The CCU has three separate data paths: the transmit bus TX 107, the receive bus RX 108 and the microcontroller local bus 119. The microcontroller 111 shares the TX bus 107 with a memory access (DMA) controller 120 and shows the RX bus 108 with a director DMA controller 121. The microcontroller 111 uses these remote buses to control the DMA controller peripherals, the control/status registers 122 and to access both the transmit buffer memory 110 and the receive buffer memory 115. The control and status registers 122 off of the microcontroller local bus 119 provide interfaces to the RFU, the modem and the CCU hardware.
>
> * * * * *
>
> The software executes on an Intel 8031 microcontroller 111. Program storage is provided for by external EPROM on the microcontroller local bus. The software is required to respond to DMA service requests in real time, maintaining up to a 64 Kbps data flow in both directions without loss of data. FIFO buffering by the stacks 128 and 129 on the modem interface provides the required slack time for the microcontroller 111 to perform the DMA block transfers and system control functions.

(Col. 50, lines 15-27, Col. 53, lines 13-22)

Figs. 19A and 19B, described in the specification as showing "the timing relationships for the transmit and receive speech blocks that are transferred between the VCU and CCU for 16-level PSK modulation," are reproduced below:

FIG. 19A

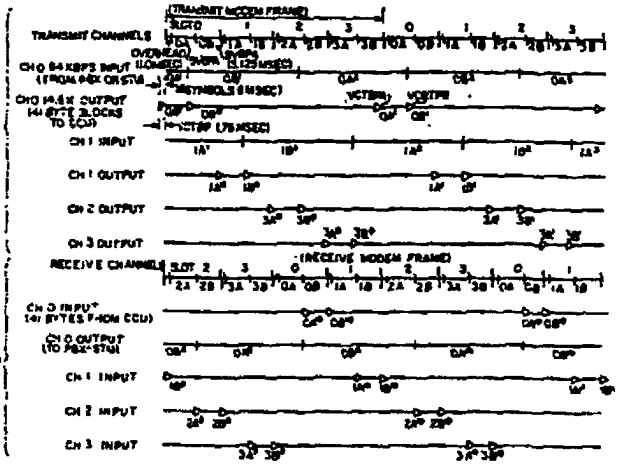


FIG. 19B

The specification explains that at the top of Fig. 19A the system frame timing is illustrated. (Col. 45, lines 12-13) Each modem frame includes four time slots labeled slot 0 to 3. Each slot is described as consisting of two "system voice block periods (SVBP)," which are labeled 0A, 0B, 1A, 1B, and so forth. As discussed above in conjunction with Fig. 21, the specification explains that "[d]ata processed by the transmit circuits in the VCU is buffered in the VCU memory until the CCU requests a DMA transfer. Forty-one bytes are transferred to the CCU during each block transfer period. Two of these blocks are transmitted per active voice channel (up to four voice channels in the base station) per TDMA frame." (Col. 49, lines 29-35) In conjunction with Fig. 19A, the specification similarly explains that "[f]or the transmit channels, one block of 328 bits (41 bytes) of processed speech is transferred from the VCU 17, 28 to the CCU 18, 29 prior to the beginning of each SVBP during a voice codec block transfer period (VCBTP)." (Col. 45, lines 21-25)

That is by no means an end to the description in the specification on this issue. Indeed, the actual written description contains far greater detail than summarized here. However, the foregoing is believed sufficient to understand the parties' dispute.

3. The Parties' Proposed Constructions

The parties' respective positions, taken from their proposed construction of claim 1 of the '089 patent, are:

InterDigital's Proposed Construction	Ericsson's Proposed Construction
A channel control mechanism connected to the signal compressor. The channel control mechanism combines the separate compressed signals from the signal compressor into a bit stream sequence. Each of the compressed signals occupies a slot in the transmit bit stream. The slot is in a defined position over a repeated sequence of slots in a frame. The recited function is combining the compressed signals received from the compression means into a single transmit bit stream. The corresponding structure is CCU 18 and equivalents thereof.	The channel control means is connected to the signal compression means. The recited function of this "means-plus-function" element is sequentially combining the separate compressed signals into a single transmit bit stream, with each of the respective compressed signals occupying a repetitive sequential position in the transmit bit stream. There is no further processing of the compressed signal before it is placed into its sequential position in the transmit bit stream. The disclosed structure is a CCU having a buffer, DMA channel and microprocessor controller programmed such that each separate compressed

[20] During the *Markman* hearing, Ericsson explained that what was intended by this last sentence was that there was no reordering after the codec:

> SPECIAL MASTER: Let me ask you – can we back up to the slide we were just looking at? I thought that one of IDC's or InterDigital's problems was actually in your last sentence, there is no further processing. Is that necessary for your construction?
>
> MR. McKOOL: Let me explain that. When we say – and, you know, we've had a little debate on our team about those three words, "no further processing." I'm not going to use those here. But what we believe is that we say no further processing as a shorthand of saying that they are not reordered after they come out of the codec; that they are not processed or changed in sequence. I'm not just adding something to the claim. The claim language says sequence, and we're trying to give effect to that. And that is the kernel of what we mean by no further processing.
>
> SPECIAL MASTER: You're saying that repetitive sequential position isn't changed.
>
> MR. McKOOL: That's right. Well, two things. That they are taken from the codecs in a repetitive sequential position and that they are placed in the time slots. See, the function talks about both in a repetitive sequential position. They come out of the codecs in the order that they are received and that they're placed in the time slots of that order. And that's what we meant by no further processing.
>
> SPECIAL MASTER: Could you live with a construction that eliminates that last sentence?
>
> MR. McKOOL: We could, yes.

Transcript at 87-88.

InterDigital's Proposed Construction	Ericsson's Proposed Construction
	signal output from one of the multiple codecs is sequentially combined, with each respective compressed signal occupying a repetitive sequential position in the transmit bit stream in the same order in which it is received from its codec. This means there is no further processing of the compressed signals before being placed.[20]

The focal point of the parties' dispute is, once again, on the "corresponding structure" under § 112(6).

4. Discussion

The analysis, of course, starts with the stated function. In claim 1 of the '089 patent, the stated function is "for sequentially combining the compressed signals into a single transmit bit stream, with each of the respective compressed signals occupying a repetitive sequential position in the transmit bit stream." [Emphasis added.] In claim 1 of the '705 patent, the stated function is "for sequentially combining the compressed signals into a single transmit bit stream, with each of the respective compressed signals occupying a respective sequential position in the transmit bit stream." [Emphasis added.]

The record does not explain why claim 1 of the '089 patent uses "repetitive sequential" while claim 1 of the '705 patent uses "respective sequential." In the case of the '089 patent, "repetitive sequential" appears in application claim 44 which, as noted above, was rejected, and subsequently cancelled. Claim 46, which ultimately became claim 1 of the '089 patent also uses "repetitive sequential." Similarly, claim 1 of the parent '863 patent calls for:

> channel control means connected to the compression means for sequentially combining the compressed signals into a single transmit channel bit stream, with each of the respective compressed signals occupying a repetitive sequential slot position in the transmit channel bit stream associated with a predetermined one of the separate compression means; [Emphasis added.]

As discussed above, claim 1 of the '705 patent resulted from application claim 44. As originally presented, application claim 44 used the phrase "respective sequential." The parties have not pointed to anything in the prosecution history of the '705 patent that would explain the difference from claim 1 of the '089 as well as from claim 1 of the common parent '863 patent. Independent review

has also found none. Additionally, other than a passing parenthetical reference in InterDigital's Pre-Hearing Reply Brief at 16:

> The ordinary meaning of "repetitive" (which does not even appear in the '705 claim feature) is repeating and relates to the time slot positions being organized within repeating frames. There is no basis for transforming "repetitive sequential" into "without further processing."

neither party has argued that the one word difference between the claims should result in different constructions.[21] Accordingly, the one word difference has been noted, but is not deemed sufficient to require differing claim constructions.

Dr. Levesque testified that the function recited in the subject claims was, in essence, a multiplexing operation:

> Q. Dr. Levesque, I believe -- I don't have it open, but I believe in your report when describing this function you, in fact -- InterDigital proposes the use of the word combining and you use the word multiplexing, I think, in your report.
>
> A. Yes. Yes. I think I actually used the phrase time division multiplexing, because that's a well-known term that was well understood by people who are experienced in communication systems.
>
> Q. Do you perceive any substantive difference between your proposed language and the proposed language that is before the Court on the screen?
>
> A. No. I think we use different words to talk about the same thing, but I think we're both talking about time division multiplexing, which is what is in these patents.

Transcript at 179-180. InterDigital says that the corresponding structure for performing that function is CCU 18. Dr. Levesque similarly testified:

> Q. Dr. Levesque, what is the corresponding structure of channel control means?
>
> A. This is the CCU. It's the CCU that actually puts the separate bit streams together, combines them together into the slot and frame format that makes up the TDM signal structure. That's done in the CCU.

---

[21] InterDigital also notes the difference between the claims in a footnote in its Post-Hearing Brief, InterDigital's Post-Hearing Brief at 11 n. 17, but does not argue that difference should result in differing claim constructions.

Transcript at 180. As is evident from the parties' respective positions above, Ericsson does not disagree. Ericsson too says that the disclosed structure is a CCU, but adds that the CCU has a buffer, DMA channel, and a microprocessor controller programmed in a particular manner.

Dr. Levesque conceded that the various specific "parts" of the CCU that Ericsson included within its proposed construction appear in the "preferred embodiment" disclosed in the specification:

> Q. I'd like to move now to Ericsson's proposed construction.
>
> Ericsson proposes or has requested that this Court insert into the proposed construction of the channel control means the words you see there: Channel control means having a buffered DMA channel and microprocessor controller." What are those things and do you recognize them and where do they come from?
>
> A. Well, I recognize them. They are essentially structured -- what I would call detailed architectural description of the microcontroller that was actually employed in the preferred embodiment in the patent. In other words, this language, a buffer, direct memory access channel, et cetera, these are all specifics of a particular microcontroller architecture.
>
> Q. And in this case, does it have some similarity or identity to what's in the preferred embodiment?
>
> A. Yes. It comes from the preferred embodiment.

Transcript at 180-181. Dr. Levesque, of course, was correct. As discussed above, the CCU described in the specification contains *inter alia* a buffered DMA channel and a microprocessor controller. Furthermore, the specification describes the programming for the CCU, and explains that "[t]he software executes on an Intel 8031 microcontroller 111." (Col. 53, lines 13-14) Dr. Levesque characterized the disclosure as referring to the "preferred embodiment." Actually, the specification discloses only *one* embodiment.

The remainder of Dr. Levesque's testimony on this issue was essentially devoted to agreeing with counsel's characterization that Ericsson's proposed claim construction incorporated additional language into the claims and that there was no technical reason to do so, of which the following is an example:

> Q. From a technical standpoint, as one skilled in the art, Dr. Levesque, is there any reason to incorporate that structure from the preferred embodiment into the language of this claim?

> A. I don't see any reason, certainly any technical reason for doing that. The original language of the claim was, I think, straightforward and unambiguous.

Transcript at 181. There may be no "technical" reason for doing so, but there is a very good legal reason for referring to the structure disclosed in the specification, namely § 112(6) – and § 112(6) applies regardless of how "straightforward and unambiguous" the claim language is.

Indeed, Dr. Levesque's further testimony highlighted the issue:

> SPECIAL MASTER: Yes, that's fine. As one of ordinary skill in the art, do you know what, just in general, a channel control unit is? Can I go to the store and buy one?
>
> A. It's not a name or a label that all – by itself, out of context, would tell you exactly what it is. So it's not like buying a modem or buying a PC or something like this. You use that name, you use that label and you know what it is you're getting. A channel control unit has to be interpreted in the context of the system that you're using it in. It's a stand-alone label. I would not say that a systems engineer would know exactly what you're talking about.

Transcript at 188. That testimony, of course, reveals the importance of the interplay of claim definiteness under § 112(2) (and the public notice function that claims serve) and the dictates of § 112(6). In this field of technology, apparently, at least according to Dr. Levesque, simply specifying a "channel control unit" or "channel control unit means" would be insufficient *per se* to inform one, even a "systems engineer," of what "exactly you're talking about." Thus, the public (including an accused infringer) justifiably, and necessarily, turns to, and relies on, the actual written description in the asserted patent to discover what the patentee actually disclosed. That is the *quid pro quo* of § 112(6). *Atmel Corp. v. Information Storage Devices, Inc.*, 198 F.3d 1374, 1382 (Fed. Cir. 1999). Moreover, InterDigital's questions based on engrafting the opposing party's proffered claim construction to the actual language of the claims in an attempt to graphically illustrate prohibited claim redrafting, significantly mischaracterizes *Markman*-type claim construction.

Once a patent issues, the claims become fixed and immutable, unless subsequently modified through statutorily authorized procedures such as reissue or reexamination. Courts can not rewrite claims, the patent owner can not rewrite claims, and the accused infringer can not rewrite claims. Even God has no statutory authority to rewrite claims.

Frequently, however, there are disagreements over what terms in a claim actually mean or, as here, what the specification discloses as the "corresponding structure" for a means-plus-function claim element. Explaining what a term or phrase in a claim means, or explaining the "corresponding structure" in the specification, is simply that – an explanation. Resolving competing, proffered explanations for disputed claim terms and phrases, including independent study and review of the same, is the fundamental sum and substance of the process mandated by the *Markman* decisions and now known as the *Markman* hearing. Offering an explanation for a term or phrase in a claim is not equivalent to attempting to rewrite a claim, and discussing the structure disclosed in the specification that provides corresponding support for a means-plus-function claim element is not a proposal to "incorporate that structure from the preferred embodiment into the language of this claim." Accordingly, superimposing an opponent's proposed claim construction on the actual language of the claim and then crying "foul" if there is a variance, is largely (and generally) unpersuasive. That is because that the "language of the claim" does not change. Here the language of the claim:

> channel control means connected to said signal compression means for sequentially combining the compressed signals into a single transmit bit stream, with each of the respective compressed signals occupying a repetitive sequential position in the transmit bit stream;

does not change, but because the applicant chose to use a means-plus-function format governed by § 112(6), the statute commands that "such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof." A proposed (or court ordered) claim construction that points to the actual "structure" disclosed in the specification is not engaging in prohibited claim redrafting, but is simply complying with the requirements of § 112(6).

The corresponding structure disclosed in the specification for performing the recited function is CCU 18, as the parties agree. There is no necessity, however, to further describe CCU 18 as having *inter alia* a buffer, DMA channel and so forth as Ericsson proposes. The specification itself provides an extensive and detailed written description of CCU 18 as the foregoing excerpts reveal. It is, however, appropriate to note that CCU 18 includes a microprocessor that is programmed in the manner described in the specification. Accordingly, the "corresponding structure" includes *inter alia* that microprocessor programmed to perform as disclosed. *WMS Gaming, Inc. v. International*

Game Tech., 184 F.3d 1339 (Fed. Cir. 1999). *Accord, Overhead Door Corp. v. Chamberlain Group, Inc.*, 194 F.3d 1261 (Fed. Cir. 1999)(corresponding "structure" included software algorithm).

Ericsson says that its proposed construction "has defined the disclosed software component of the structure by focusing on what the software must be able to do." Ericsson's Post-Hearing Brief at 17. But the claim itself defines "what the software must be able to do," or, more accurately, the claim itself defines the function that must be performed by the "corresponding structure" disclosed in the specification which, in this case, includes both hardware and software. Specifically, the hardware and software of CCU 18 together constitute the "corresponding structure" that performs the function of "sequentially combining the compressed signals into a single transmit bit stream, with each of the respective compressed signals occupying a repetitive sequential position in the transmit bit stream." It is not necessary to further define the software because it is fully disclosed in detail in the specification. That software or algorithm, as the Federal Circuit noted in *WMS Gaming*, is part of the "corresponding structure."

InterDigital notes, and correctly so, that the "corresponding structure" for purposes of § 112(6) extends only to the disclosed structure for performing the claimed function. *See Chiuminatta Concrete Concepts, Inc. v. Cardinal Indus. Inc.*, 145 F.3d 1303, 1308 (Fed. Cir. 1998). InterDigital's Post-Hearing Brief at 12. The same rationale applies to the disclosed software. The software that is part of the "corresponding structure" is the software that, in cooperation with the hardware of CCU 18, performs the claimed function of "sequentially combining the compressed signals into a single transmit bit stream, with each of the respective compressed signals occupying a repetitive sequential position in the transmit bit stream." To the extent the disclosed software performs functions unrelated to that claimed function, it is not part of the "corresponding structure."

There is also another issue lurking under the surface that should be addressed, although not particularly apparent from the parties' respective proposed claim constructions. As noted above, InterDigital proposes, in part, the following construction:

> A channel control mechanism connected to the signal compressor. The channel control mechanism combines the separate compressed signals from the signal compressor into a bit stream sequence. Each of the compressed signals occupies a slot in the transmit bit stream. The slot is in a defined position over a repeated sequence of slots in a frame.

> The recited function is combining the compressed signals received from the compression means into a single transmit bit stream.

It is immediately apparent from simply reading the claims, however, that the recited function is not "combining the compressed signals received from the compression means into a single transmit bit stream," but rather "sequentially combining the compressed signals into a single transmit bit stream, with each of the respective compressed signals occupying a repetitive sequential position in the transmit bit stream." This is an example of rewriting a claim as opposed to explaining a disputed term in a claim, *i.e.*, an instance of the pot calling the kettle black.

But, in this instance, both the pot and kettle have perhaps been on the fire too long. Ericsson says that the "recited function of this 'means-plus-function' element is sequentially combining the separate compressed signals into a single transmit bit stream, with each of the respective compressed signals occupying a repetitive sequential position in the transmit bit stream. There is no further processing of the compressed signal before it is placed into its sequential position in the transmit bit stream." [Emphasis added.] Once again, the function recited in the claim is "sequentially combining the compressed signals into a single transmit bit stream, with each of the respective compressed signals occupying a repetitive sequential position in the transmit bit stream." The claim does not by its terms require "separate compressed signals" and does not prohibit "further processing."

In both instances, the parties are, apparently, attempting to advance their underlying substantive arguments. There is a place for that. It is not here. Representing what claims actually say is not subject to literary license, and taking liberties with claim language should never be persuasive.

What really is at issue here, and what the parties talk around, is what Ericsson actually means when it says: "There is no further processing of the compressed signal before it is placed into its sequential position in the transmit bit stream." What Ericsson actually means is:

> SPECIAL MASTER: You're saying that repetitive sequential position isn't changed.
>
> MR. McKOOL: That's right. Well, two things. That they are taken from the codecs in a repetitive sequential position and that they are placed in the time slots. See, the function talks about both in a repetitive sequential position. They come out of the codecs in the order that they are received and that they're placed

in the time slots of that order. And that's what we meant by no further processing.

Transcript at 88. Dr. Levesque, on behalf of InterDigital, disagreed:

> Q. Once again, Ericsson proposes inserting an entire sentence at the end of this claim feature saying, "There's no further processing of the compressed signal before it's placed into its sequential position in the transmit bit stream." Do you see any reason to insert that language in this claim?
>
> A. No. I don't see anything in the patent that precludes that.
>
> Q. Do you disagree with – do you agree or disagree with that statement?
>
> A. I disagree with that statement.

Transcript at 181-82.

But, when asked to explain the reason for that disagreement, Dr. Levesque based his view on the fact that there were alternatives to what was disclosed in the specification:

> Q. Would you explain to the Court why, please.
>
> A. Well, I use this chart, which actually one of the gentlemen used this morning. This is Table 3, which describes or shows the channel frame structure. This is one of several examples in the patent. This one is drawn for the specific case of 16-ary modulation, which means 4 bits per transmission symbol in the channel. And the numbers are worked out to correspond to that.
>
> * * * * *
>
> Also, I want to point out that these are two successive independent voice frames coming out of the codec. But the numbers here have been worked out for the particular codec that's talked about in the patent. In other words, a codec with a rate in the vicinity of 16 kilobits per second, then this format allows putting two of these 82 symbol packets into – into the frame here.
>
> I just want to make an observation that if using this patent, if we were to choose to find, for example, a lower rate vocoder that gave us the kind of performance we wanted to have but operated at a lower rate, then we could take this same frame structure and we could free up some bits in each one of these slots and use them for other purposes.
>
> Let me – just for the sake of example, let me say that we found a codec that gave us the performance we wanted with only half the bit rate of the codec that's used in the example in this preferred embodiment. Then I could use – that would, in effect, free up 82 of these symbols in each one of these slots, and I could then use those 82 symbols for some other purpose. For example, I could put some error-control coding in there that would improve the performance on a radio link. And that's just one example.

* * * * *

> So, it seems to me that the other processing – other information could be inserted into the same format. And I would also point out that if we did that, then I believe that we would not in any way be violating the language of the claim that talks about repetitive sequential placement of the traffic. The traffic would still be placed in there in a repetitive sequential manner. It's just that there would then be some other information.
>
> I'm just using that as an example of something that might be done to enhance system performance. And would – I believe would not be in violation of this claim.

Transcript at 182-185. That there may be alternatives, however, even alternatives that "would not be in violation of" the literal language of the claims, is not what is presently before the Court. The sole present issue is determining what the specification describes as the "corresponding structure" for the recited function of the "channel control means." In short, Dr. Levesque's testimony of what *might* be substituted for that described in the specification, or what one of ordinary skill in the art *might* know to use based on the description in the specification, may be relevant at trial when the "and equivalents thereof" portion of § 112(6) is considered. But here, the issue is what the written description actually discloses.

It is sufficient at this stage of the proceedings to conclude that the recited function of the "channel control means" claim element is "for sequentially combining the compressed signals into a single transmit bit stream, with each of the respective compressed signals occupying a repetitive sequential position in the transmit bit stream" and that the corresponding structure disclosed in the specification for performing that function is CCU 18 and the related software also described in the specification for performing that recited function. The actual hardware components that are disclosed as forming CCU 18 and the accompanying software are fully described in the specification and no separate "conclusion of law" by the Court is required. Under the express requirements of § 112(6), the "channel control means" claim element must be construed as covering that "corresponding structures * * * and equivalents thereof." What is or is not an "equivalent" under § 112(6) to that disclosed in the specification is a matter for trial.

5. Recommendation

Accordingly, the special master recommends that the Court conclude as follows:

> The claimed function of the "channel control means" element of claim 1 of the '089 patent and '705 patent is "for sequentially combining the compressed signals into a single transmit bit stream, with each of the respective compressed signals occupying a repetitive sequential position in the transmit bit stream" and "for sequentially combining the compressed signals into a single transmit bit stream, with each of the respective compressed signals occupying a respective sequential position in the transmit bit stream," respectively. Although the claimed functions differ by a single word, the Court concludes that there is no substantive distinction between the two based on the current record.
>
> The "corresponding structure" disclosed in the specification common to both patents for performing the claimed function is CCU 18 and the associated software for performing that function as described in the specification.

Under the terms of § 112(6), those claims should therefore be construed to cover that corresponding structure and equivalents thereof.

D. "transmitter and receiver means"

1. The Claims

Yet once again, the focus is on claim 1 in both the '089 and '705 patents which call for, in nearly identical terms:[22]

> transmitter and receiver means both at said base station and at said subscriber stations for providing direct communication between said base station and said subscriber stations over the said radio frequency (RF) channels;

Both parties agree that the "transmitter and receiver means" clause is drafted in means-plus-function format and should be governed by § 112(6). On independent review, the special master agrees applying the same analysis that has been applied to the preceding means-plus-function claim elements. Additionally, the claim element is clear in specifying the location of the "transmitter and receiver means," *i.e.*, "both at said base station and at said subscriber stations," and there can be little dispute that the claimed function is "for providing direct communication between said base station and said

[22] Claim 1 of the '089 patent refers to "said subscriber" (first occurrence) rather than "said subscriber stations" as appears in claim 1 of the '705 patent, reproduced above. Neither party contends that difference is material to claim construction.

subscriber stations over the said radio frequency (RF) channels." Thus, the issue that requires resolution is what constitutes the "corresponding structure" disclosed in the written description.

2. The Parties' Proposed Constructions

The issue that divides the parties is whether the requirement for "direct communication" in the functional portion of the claim element requires (1) a modem, or (2) even more specifically, a PSK, *i.e.*, phase shift key, modem.

InterDigital's Proposed Construction	Ericsson's Proposed Construction
Both the base station and the subscriber have a transmitter and a receiver. The transmitters and receivers provide direct communication between the base station and the subscriber stations over the radio frequency (RF) channels.	The transmitter and receiver means is at both the base station and the subscriber stations.
The recited function of the transmitter and receiver is to provide direct communication between the base station and the subscriber stations over RF channels.	The recited function of this "means-plus-function" element is providing direct communication between the one base station and its subscriber stations over RF channels.
The corresponding structure is the RF/IF Unit (RFU) 21 and the Antenna Interface Circuit 22 and equivalents thereof.	The disclosed structure is a PSK modem, RFU, and antenna interface and antenna at the base station and each of the subscriber stations.
	As a matter of law, the claim element cannot encompass structure that uses GMSK modulation.

InterDigital contends that the disclosed structure that performs the claimed function is the RFU subsystem and antenna interface circuit because those are the structures that provide the communications channel link, *i.e.*, the "direct communication." InterDigital's Post-Hearing Brief at 12. Specifically, InterDigital points to the following portion of the specification:

> The RFU subsystem provides the communications channel link between the modem and the antenna in both the base station and the subscriber station. The RFU functions as a linear amplitude and frequency translator and is essentially transparent to the channel data and modulation characteristics.

(Col. 68, lines 1-8)

Ericsson, on the other hand, urges that the "intrinsic evidence confirms that a modulator/demodulator is part of the structure required to actually achieve the recited "direct communication" between the base station and its subscriber stations over the RF channels." Ericsson's Post-

Hearing Brief at 19. Specifically, Ericsson points to the discussion in column 8 of the specification common to the subject patents that explains:

> Properly formatted transmit data from each CCU 18 is transferred at a 16 K symbol/second rate to the modem corresponding 19. Each modem 19 takes these synchronous symbols and converts them to a Gray-coded multi-level phase shift keyed (PSK) format. The transmit channel output of the modem 19 is a modulated IF signal. This signal is fed into the RF/IF processing unit (RFU) 21 which then converts the IF signal to the RF UHF signal in the 450 MHz range. Control signals for the modem 19 and the RFU 21 are provided by the corresponding CCU 18, working under the overall control of the RPU 20. The UHF signal is amplified by power amplifiers in the RFU 21 and transferred through an antenna interface unit 22 to a transmit antenna 23 for open-air broadcast.

(Col. 8, lines 49-64) Ericsson is correct that the specification discloses that modem 19 at the base station is the structure that converts transmit data from each CCU 18 into PSK format. That signal, in turn, is "fed into" RFU 21 which converts the IF signal to the RF UHF signal which is then transferred through antenna interface unit 22 for broadcast. In the immediately following paragraph, the specification says that the "receive function of the base station is essentially the reverse of the transmit function." (Col. 8, lines 65-67) With respect to the subscriber stations, the specification describes similar components:

> The subscriber station includes a VCU 28, CCU 29, modem 30a and a RFU 31a that perform similar functions as the like units described above in the base station architecture description related to FIG. 2.

(Col. 9, lines 41-44) There is, however, a difference:

> One difference in the subscriber station operation is that usually it is limited to only one voice channel at a time. The subscriber station essentially operates in the half-duplex mode, transmitting in a portion of the TDMA frame and receiving in a different portion of the TDM frame.

That difference at the subscriber station is addressed in the last claim element of claim 1 of the '089 patent which calls for:

> each subscriber station operating in a half-duplex mode within a time division multiple access frame wherein it transmits in one portion of said frame and receives in another portion of said frame.[23]

[23] Claim 1 of the '705 patent does not have a parallel provision.

Ericsson argues that further supports its contention that the "transmitter and receiver means" claim element necessarily includes a modem because the specification only discloses a modem as performing the recited half-duplex mode of operation. Ericsson's Post-Hearing Brief at 19.

3. Discussion

Ericsson is correct. The specification explains that:

> The modem operates in one of three operation modes. In the base station, the modem carries on a full-duplex transmit and receive function. When operating in the subscriber station, the modem operates in a half-duplex mode, transmitting during part of the TDMA frame and receiving during another part of the TDMA frame. The third mode is a self-adapting training mode. One modem design accommodates all these functions. The modem performs the appropriate function in response to keying signals coming in from the controlling CCU.

(Col. 61, line 67-col. 62, line 8) As is readily evident, the specification clearly refers to the modem as carrying on the "transmit and receive function" whether in full-duplex mode at the base station or in half-duplex mode at the subscriber stations.

The specification also explains that the modems at the base and subscriber stations are identical, and that a block diagram of the same is shown in Fig. 25:

> The subscriber station modem 30a and the base station modem 19 are identical. A block diagram of the modem is shown in FIG. 25.

(Col. 62, lines 9-11) Fig. 25 illustrates the following:

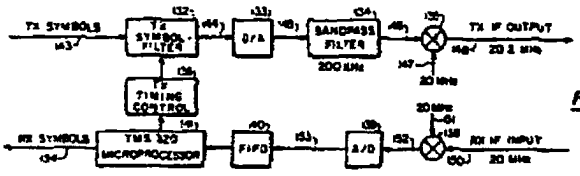


FIG. 25

The specification explains that the acronyms "TX" and "RX" refer to "Transmit" and "Receive," respectively. (Col. 5, lines 54, 63) "IF" refers to "Intermediate Frequency." (Col. 5, line 33) Thus, on the right-hand side of the drawing "TX IF OUTPUT" means "transmit intermediate frequency output" and "RX IF INPUT" means "receive intermediate frequency input." Additionally, the specification repeatedly refers to the "modem transmitter sections" and the "modem receiver sec-

tion," *see generally*, columns 62-67, and specifically refers to modem transmitter section as including *inter alia* a "TX (transmitter) timing control circuit 136." (Col. 62, lines 12-15)

The specification could hardly be clearer. The claimed function is "for providing direct communication between said base station and said subscriber stations over the said radio frequency (RF) channels." RFU 21 and the antenna interface circuit 22 contribute to that function, but do not alone fully perform that function. The "corresponding structure" that is described for performing the recited function of the "transmitter and receiver means" includes the modem(s) described in the specification.[24] Specifically, the "corresponding structure" disclosed in the specification for performing the claimed function consists of a modem, RFU, antenna interface and antenna at the base station and each of the subscriber stations.

The question then becomes whether proper claim construction requires the Court to additionally specify that the "corresponding structure" is a PSK modem. It does not.

Ericsson notes that the only modem disclosed in the specification is a PSK modem. That is correct. InterDigital does not contend otherwise, but argues that "one skilled in the art would identify a modem without limiting it to a particular type of modulation * * *," and "[b]ecause one of ordinary skill in the art would know that a modem is not constrained to a particular type of modulation, PSK defines additional structure beyond that necessary to perform the claim function." InterDigital's Post-Hearing Brief at 13. Ericsson responds that InterDigital's argument is based on a misreading of *Atmel*, and because InterDigital chose to cast this claim element in means-plus-function form and disclose only a PSK modem, InterDigital can not now "escape the requirements of its election." Ericsson's Post-Hearing Brief at 20-22.

There is truth in what both parties say. InterDigital is correct that the Federal Circuit in *Micro Chemical, Inc. v. Great Plains Chemical Co., Inc.*, 194 F.3d 1250, 1258 (Fed. Cir. 1999)(*Micro Chemical II*), reminded the bar that although § 112(6) "requires both identification of the claimed function and

[24] As Ericsson notes, Ericsson's Post-Hearing Brief at 20, that construction is consistent with InterDigital's prior construction of this same claim element during the *Motorola* litigation. In its "Memorandum of InterDigital Technology Corporation in Support of its Motion to Alter or Amend Judgment, for Judgment as a Matter of law or, in the Alternative, for a New Trial," InterDigital stated, in reference to claim 1 of the '089 patent, that "the 'transmitter and receiver means' at the base station and subscriber units are the devices which modulate and transmit, and receive and demodulate, the radio frequency signals which are sent between the base station and subscriber stations enabling them to communicate with each other." Ericsson Exhibit 149 at 25.

identification of the structure in the written description necessary to perform that function," the "statute does not permit limitation of a means-plus-function claim by adopting a function different from that explicitly recited in the claim," nor "does the statute permit incorporation of structure form the written description beyond that necessary to perform the claimed function." There, the district court had violated both rules. The patent-in-suit was directed to machines and methods for weighing, dispensing, and delivering "microingredients" (*i.e.*, very small quantities) into livestock feed. An apparatus claim in issue called for "weighing means for determining the weights of selected additives dispensed by said dispensing means from said storage means." The district court had added "sequential and cumulative weighing" to the recited function. As a result, the district court had included "corresponding structure" to accomplish that added function; structure that was missing in the accused system. Accordingly, the Federal Circuit concluded that the district court had erred in finding no literal infringement. Indeed, the Federal Circuit found that the accused machines literally infringed when the claim was given its correct interpretation.

On the other hand, the Federal Circuit in *Cortland Line Co., Inc. v. Orvis Co., Inc.*, 203 F.3d 1351 (Fed. Cir. 2000) noted, under the facts of that case, that when the specification discloses only one structure corresponding to a means-plus-function limitation, then the means-plus-function limitation is limited to that structure. Cortland's patent-in-suit was directed to a fishing reel with an easily interchangeable cartridge fishing line spool. The district court had held, on summary judgment, that Orvis' accused reel did not infringe Cortland's patent either literally or under the doctrine of equivalents. On appeal, the Federal Circuit affirmed that portion of the district court's judgment.

One of the claim elements in *Cortland* called for "means for connecting said second end plate to said first spool axle." The Federal Circuit agreed that element was cast in means-plus-function form and should be construed under § 112(6). An examination of the specification, the court said, "discloses only one structure corresponding to means for connecting – threaded connectors," and "[b]ecause the specification describes only one structure corresponding to the connection function, this court limits the connecting means element to threaded connectors and equivalents thereof." 203 F.3d at 1357.

The present case has elements common to both *Micro Chemical II* and *Cortland*. The recited function is "for providing direct communication between said base station and said subscriber stations over the said radio frequency (RF) channels." As discussed above, the "corresponding struc-

ture" disclosed in the specification that performs that function consists of a modem, RFU, antenna interface and antenna at the base station and each of the subscriber stations, all as described in the specification. A modem, of course, takes its name from, and is, by definition, the combination of a modulator and a demodulator.[25] The specification confirms that the disclosed modem provides modulation and demodulation, and further that such modulation and demodulation is a necessary component to performing the function of communicating between the base station and the subscriber stations.

That modulation may be necessary to perform the recited function of communicating does not necessarily limit the claim to a specific *type* of modulation. Even in the case of means-plus-function clauses construed under § 112(6), applicants enjoy some latitude (and hence claim scope) by properly crafting the statement of function. The claim element, as written, sweeps the modem into the "corresponding structure" under § 112(6). Modems by their very nature perform modulation (and demodulation). One might argue that the claimed function thus perforce encompasses modulation, but this language of the claim now under examination does not *per se* require any specific type of modulation.

In *Micro Chemical II*, the stated function of the "weighing means" was "for determining the weights of selected additives dispensed by said dispensing means from said storage means." The disclosed apparatus actually provided for "sequential and cumulative weighing," but the claim itself was not so limited. The situation here is roughly analogous (although clearly there are distinctions) in that by presenting and obtaining a claim with a broadly stated function of communicating, such a functional statement embraces more "corresponding structure" than would have a more narrowly crafted functional statement. One of the structures embraced, *i.e.*, the modem, not only necessarily provides, but is disclosed as providing, modulation. That is the first step. In order to go to the second step of limiting the claim to a PSK modem, however, there must be something in the claim itself that is so limiting, and here there is not.

Should that result change when the only modem disclosed in the specification performs PSK modulation, and § 112(6) applies? Perhaps in other cases, but under the facts of this case, no. The

[25] It is commonly understood that "modem" is derived from modulator-demodulator. *See also* Testimony by Dr. Gibson, Transcript at 721: "A. A modem is a modulator demodulator."

specification here is replete with references to forms of PSK modulation. The specification, for example, explains that:

> Communication between the base station 11 and the subscriber stations 10 is accomplished digitally by filtered multiphase differential phase shift keying (MDPSK) modulation on 25 KHz spaced full duplex channels in the 454 to 460 MHz band, thereby satisfying the requirements of 20 KHz bandwidth such as designated in FCC rule Parts 21, 22 and 90 (e.g., 21.105, 22.105 and 90.209). This system may also be used for other band widths and spacings within any feasible portion of the VHF, UHF and SHF spectrums.
>
> The symbol rate on each 25 KHz FCC channel is 16 kilosymbols/second in each direction. Voice transmission is accomplished using 16 level PSK modulation and voice digitization with a coding rate of 14.6 Kbps. Alternatively, the modulation may be two-level (BPSK) or four-level (QPSK). * * *

(Col. 6, lines 43-59) There is simply no doubt that, reading the specification as a whole, PSK modulation is not merely the preferred modulation technique disclosed, it is the only modulation technique disclosed. But that does not of itself mean that the claims are limited to that single modulation technique. Applicants for a patent are required to disclose an embodiment of their invention, but they are certainly not required to disclose all possible embodiments, or even all embodiments that they might be aware of, subject to the best mode disclosure requirements of 35 U.S.C. § 112(1). In some instances, for example in the case of the CCU discussed above, the technology is such that an applicant must identify some specific collection of components because, as Dr. Levesque testified:

> A. It's [a channel control unit or CCU] not a name or a label that all – by itself, out of context, would tell you exactly what it is. So it's not like buying a modem or buying a PC or something like this. You use that name, you use that label and you know what it is you're getting. A channel control unit has to be interpreted in the context of the system that you're using it in. It's a stand-alone label. I would not say that a systems engineer would know exactly what you're talking about.

Transcript at 188. There was no testimony that a modem, an ubiquitous, rather common, electronic component familiar to many, should fall within the same category as a CCU. A modem does not *per se* require interpretation within the context of the system; a modem provides modulation and demodulation as is evident from its very name.

In *Cortland*, the claim-at-issue called for a "means" for "connecting said second end plate to said first spool axle." The specification revealed only one structure for performing that stated function, *i.e.*, treaded connectors. The Federal Circuit accordingly, and appropriately, held that the connecting means element was limited to threaded connectors and equivalents thereof. In similar fashion, the patentees here disclosed a modem, RFU, antenna interface and antenna at the base station and each of the subscriber stations that performed the function of "for providing direct communication between said base station and said subscriber stations over the said radio frequency (RF) channels." Going a step further and limiting the modem to a PSK modem would be roughly analogous to limiting the patentee in *Cortland* to the actual type, or pitch, of the "threaded connectors," which, of course, would not have been justified by the actual functional language of the claim-at-issue.

4. Recommendation

Accordingly, the special master recommends that the Court conclude as follows:

> In the "transmitter and receiver means" claim element of claim 1 of both the '089 and '705 patents, that "means" is located at both the base station and at the subscriber stations. The recited function is "for providing direct communication between said base station and said subscriber stations over the said radio frequency (RF) channels." The "corresponding structure" under § 112(6) disclosed in the specification that performs that function consists of a modem, RFU, antenna interface and antenna at the base station and each of the subscriber stations, all as described in the specification. This claim element is not limited to a modem that provides PSK modulation.

Under the terms of § 112(6), the claims should therefore be construed to cover that corresponding structure and equivalents thereof.

V.
The '705 Patent

A. "means to determine synchronization"

1. The Claim

Here the dispute focuses solely on claim 1 of the '705 patent-in-suit which calls for, in part:

> means to determine synchronization between the base station and the subscriber stations utilizing a code for exchanging the current state of the connection therebetween, the link quality and the power and timing adjustments.

Once again the parties agree that this "means" clause is in a means-plus-function format and should be governed by § 112(6). Applying the analysis discussed above, the special master agrees.

2. The Parties' Proposed Constructions

The parties respective positions are:

InterDigital's Proposed Construction

A mechanism that determines synchronization between the base station and the subscriber station. The mechanism uses a code, which is a set format for conveying information. The code is used to exchange information about:

(a) the current state of an existing connection between the base station and subscriber stations

(b) the quality of the signal over the link;

(c) the signal power; and

(d) timing adjustments.

The recited function is determination of synchronization between the base station and the subscriber stations utilizing a code for exchanging the state of the connection, link quality, power, and timing adjustment.

The corresponding structure is (a) the CCU 18 and RPU 20 in the base station and (b) the CCU 29 and STU 27 in the subscriber station and equivalents thereof.

Ericsson's Proposed Construction

The recited function of this "means-plus-function" element is determining synchronization between the base station and the subscriber stations, utilizing a code for exchanging the current state of the connection between the base station and the subscriber station, the link quality, the power adjustment, and the timing adjustment.

The use of the phrase "utilizing a code for exchanging" requires that the code be exchanged between the single base station and the subscriber stations and be exchanged between the subscriber stations and the single base station. This means it is bidirectionally exchanged.

The disclosed structure is a CCU at the base station and a CCU at each subscriber station, each CCU including a microcontroller and associated software which generates a bidirectionally exchanged 12-bit code word within every time slot of the transmit bit stream and processes the code for error correction and detection to determine synchronization.

InterDigital's Proposed Construction	Ericsson's Proposed Construction
	As a matter of law, all of those four types of information must be exchanged in the 12 bit code word.

The controversy centers on the now familiar issue of defining the "corresponding structure."

3. The Function

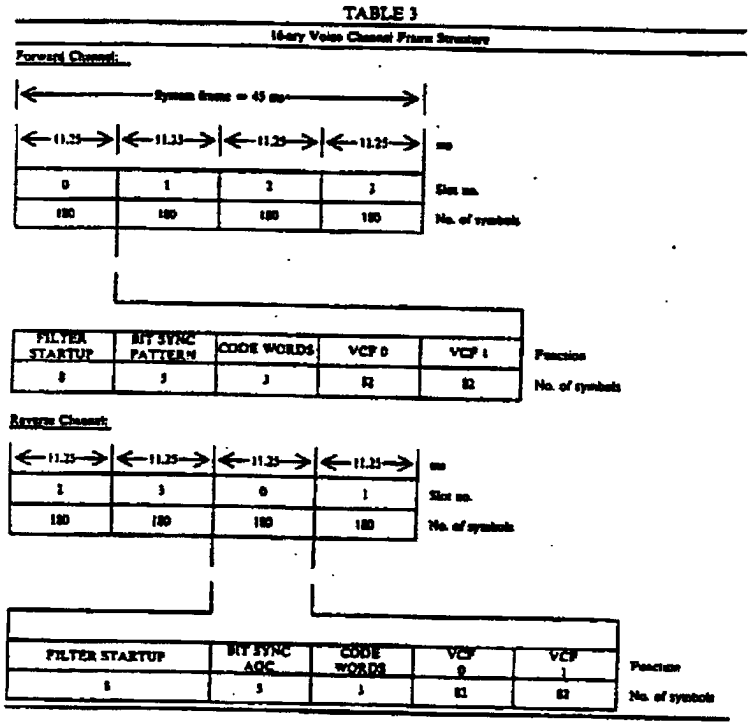
Before turning to the structure, however, the actual function called for in the claim must be identified. According to the clear language of the claim, the claimed function of the "means" is "to determine synchronization between the base station and the subscriber stations." Although both parties in their respective proposed constructions set out above also incorporate the next following clause, *i.e.*, "utilizing a code for exchanging the current state of the connection therebetween, the link quality and the power and timing adjustments" in the statement of function, the claim does not say that. The *function* is to determine synchronization. That *function*, though, is limited to using the recited code. Moreover, as discussed below, the specification expressly states that a twelve bit code word is used to determine synchronization between the subscriber and base station, *i.e*, the twelve bit code word is, per the express language of the specification, the "corresponding structure" that performs the claimed function of determining synchronization. In this instance, therefore, the ultimate outcome does not change regardless of whether "utilizing a code for exchanging the current state of the connection therebetween, the link quality and the power and timing adjustments" is read as part of the claimed function or not.

4. The Corresponding Structure

The parties agree that the hardware component is a CCU at the base station and each subscriber station, namely CCUs 18 and 29. InterDigital adds RPU 20 in the base station and STU 27 in the subscriber station. It does not appear that Ericsson has taken a firm position whether RPU 20 and STU 27 comprise part of the "corresponding structure" or not, although Ericsson focuses its arguments on the CCU. Specifically, Ericsson argues that the "corresponding structure is not only CCU hardware, but also software that implements the exchange of a 12-bit code word in every time slot.". Ericsson's Post-Hearing Brief at 22.

Table 3 in the specification is said to illustrate the structure of a 180 symbol 16-ary voice channel slot type:

TABLE 3



The specification explains that

> Referring to Table 3, the structure of the 180 symbol 16-ary voice channel slot type is described. The first 8 symbols of this slot type are referred to as filter startup bits. The filter startup period, which is included at the beginning of every slot type, is a time in which no energy is transmitted, giving the receive section of the modem 19 time to purge its filters in preparation for the new slot.
>
> Following the filter startup is a bit sync period. During this time, a degenerated 16-ary pattern is transmitted which simulates an alternating BPSK signal. The receive section of the modem 19 uses this field to establish the phase reference of the transmitter section of the modem 19.

(Col. 19, lines 21-35) The specification next explains the role of a 12-bit "code word:"

> Next, a twelve bit code word is used to determine synchronization between the subscriber and base station and to exchange control and status information.

> Code words are used to exchange the current state of the connection, link quality and power and timing adjustments. Each control word is encoded into ten bits using a Hamming code, which allows single error correction and double error detection. The CCU 18 determines the gain and loss of synchronization by tracking the number of consecutive code words received correctly or incorrectly; and the CCU 18 passes synchronization changes to the RPU 20 in the base station. In the subscriber station, the CCU 29 passes synchronization changes to the STU 27. [Emphasis added.]

(Col. 19, lines 36-49) Once again, the recited function in the claim is "to determine synchronization between the base station and the subscriber stations." The specification plainly explains that function is performed by "a twelve bit code word." The specification also says that "[c]ode words are used to exchange the current state of the connection, link quality and power and timing adjustments," which is parroted in the claim limiting the function to "utilizing a code for exchanging the current state of the connection therebetween, the link quality and the power and timing adjustments." The "structure" described in the specification for performing the stated function is the "twelve bit code word."

The specification also, however, explains that the "CCU 18 controls the TDMA functions and also functions as a link-level processor. * * * Each CCU 18 determines the modulation levels, as directed by a remote-control processor unit RPU 20, to be used for the broadcast (such as 2, 4 or 16 level PSK modulation). Each CCU 18 also processes control information for communication to the subscriber stations through the radio channel (RCC) time slot and during overhead control bits in the voice channels." (Col. 8, lines 32-44) On the subscriber side, the specification explains that the "STU in the subscriber station also performs all control functions of the subscriber stations just as the RPU functions in the base station," (Col. 9, lines 26-29), and that "CCU 29 * * * perform[s] similar functions as the like units described above in the base station * * *." (Col. 9, lines 40-42)

Accordingly, InterDigital is correct that the "corresponding structure" disclosed in the specification for performing the claimed function includes CCU 18 and RPU 20 in the base station and CCU 29 and STU 27 in the subscriber stations. That "corresponding structure," however, also includes the "twelve bit code word" discussed above. InterDigital's argument that a " 'code' is not the

means that determines sychronization," InterDigital's Post-Hearing Brief at 15, is simply belied by the specification.[26]

Additionally, InterDigital's own expert, Dr. Levesque, confirmed that the CCUs, RPU and STU used code words to determine if a channel was "out of sync."

> Q. (By Ms. Addison) Dr. Levesque, I would like to begin with the means to determine synchronization of the '705. Would you please tell the Court, in your view, what is the recited function of this claim?
>
> A. The recited function is determining synchronization between the base station and subscriber stations utilizing the code. Code is for exchanging these four quantities that are -- four categories of information that are shown here: state of connection, link quality, power, and timing adjustment.
>
> Q. Would you please tell the Court what corresponding structure did you identify, sir, that performed the recited function?
>
> A. Well, in the base station, the corresponding structure is the CCU and the RPU. In the subscriber station, the CCU, once again, and the STU.
>
> Q. How does the structure that you have just described use code words?
>
> A. Well, there's a process of transmitting code words and then checking for validity using an error detection routine on the receive end. The code word is

[26] This also dispenses with InterDigital's argument that "the code is neither subject to construction under § 112, ¶ 6 nor limited to a specific variable format of the preferred embodiment," InterDigital's Post-Hearing Brief at 15, citing *IMS Technology, Inc. v. Haas Automation, Inc.*, 206 F.3d 1422 (Fed. Cir. 2000). In *IMS Technology*, the § 112(6) issue in the case was the "equivalency" between a floppy disk drive and a tape cassette in the context of a control for a milling machine. The invention of the patent-in-suit permitted interactive programming of a machine tool *e.g.*, a milling machine. The machine operator could choose a particular operation represented by a "data block" and the system would then prompt the operator for additional parameters.

The claims called for an "interface means" which the district court had construed as a means-plus-function element governed by § 112(6) and further that the "corresponding structure" included a tape cassette. The accused infringing device used a floppy disk drive. The district court granted the defendant summary judgment of non-infringement finding that a floppy disk drive and a tape cassette were not equivalent structures. On appeal, the Federal Circuit, implicitly acknowledging the physical differences between a floppy disk drive and a tape cassette, reversed and remanded finding that there was a genuine issue of material fact whether a floppy disk drive and a cassette drive were "equivalents" within the context of the invention.

The claims also, however, called for "display means * * * said apparatus including means to sequentially display data block inquiries." Contrary to the interpretation of the district court, the Federal Circuit noted that "data block" was not part of the process that performed the required function and therefore required interpretation outside the ambit of § 112(6) even though contained within a means-plus-function clause. Construed in light of the specification, the Federal Circuit said, "data block" meant a "computer data structure containing the information needed by a machine tool to perform a single machining operation," and was not limited to the specific set of variables and display sequences set out in the written description.

In contrast, here the specification clearly explains that the 12-bit code word performs the recited function and, indeed, uses words in the claim that effectively parrot the words of the specification. Each case must, of course, be resolved on its own facts, and here those facts simply do not support InterDigital's argument.

> searched for -- that's not a good phrase. There's a search for the code word in a designated position. And if no code word is detected for five consecutive frames, then the channel is declared to be out of sync. And then it is up to the RPU to take whatever appropriate action would follow and out of sync condition. [Emphasis added.]

Transcript at 192-193.

InterDigital also argues that the "12-bit code word" is merely "a specific example of the best mode described in the preferred embodiment." *Id.* The specification excerpt above explains that a "Hamming code" is used. The specification further explains that:

> The Hamming code adds five parity bits to five bits of information to produce a ten bit code. Each parity bit is calculated by doing a modulo-two addition of all bits in positions within the code word which contain the bit represented by the parity bit. Though the code word is sent with all data bits contiguous, followed by all parity bits, by arranging the parity bits in positions within the word with just one bit on (the position represented by the bit) and placing the data bits in the other positions, the code can be visualized as follows:

bit position:	1	2	3	4	5	6	7	8	9
info:	P1	P2	D1	P3	D2	D3	D4	P4	D5

> P = parity bit
> D = data bit
> P1 = D1 + D2 + D4 + D5
> P2 = D1 + D3 + D4
> P3 = D2 + D3 + D4
> P4 = D5
> P5 = overall

> When a code word is received, parity bits are calculated from the received data bits and compared with the received parity bits. If the calculated overall parity bit is different from the received overall bit, then the calculated parity bit is exclusive-or'd with the received bits to indicate the address of the bit in error. If the calculated and received overall bits are the same and the other four bits are not, two errors have been detected. If all parity bits are the same, the data has been received correctly.
>
> The remainder of the slot contains two voice codec packets containing 328 bits of information each.

(Col. 19, line 50-Col. 20, line 15) Pointing in part to the foregoing, InterDigital argues that the "12-bit code word" is simply "a convenient example because it can be easily divided into various sub-

components or symbols [referencing Tables 2[27] and 3] and "[m]oreover, the specification teaches that the code word only requires 10 bits, comprising 5 bits of information and 5 parity bits," pointing to the foregoing portion of the specification.

As Ericsson points out, however, Ericsson's Post-Hearing Brief at 24 n. 42, Table 3 shows, for both the forward and reverse channels, that the transmitted "code words" comprise 3 symbols. The specification teaches that "the 16-ary voice channel transmits 4 bits of information per symbol." (Col. 13, lines 61-62) Arithmetically, 3 symbols x 4 bits/symbol = 12 bits. Table 2, which shows a similar 4-ary system, says that the "code words" comprise 6 symbols. In a 4-ary system, the specification explains that "2 bits are transmitted per symbol." (Col. 14, lines 2-3) Once again, 6 symbols x 2 bits/symbol = 12 bits. Also, as noted above, the specification without qualification says that "a twelve bit code word is used to determine synchronization." Yet further, even if the description of the Hamming code could be construed as suggesting that other than a 12-bit code word might be used (and that is not at all clear from the description) the fact remains that the specification clearly discloses – and only discloses – a 12-bit code word for performing the claimed function, in conjunction with CCUs 18 and 29, RPU 20, and STU 27.

Ericsson's proposed construction adds that "each CCU" includes "a microcontroller and associated software." As discussed above, it is a true statement that the specification so describes the CCUs. Fig. 21 and the accompanying disclosure illustrate and explain that the CCUs have a "microcontroller module" 111 and that the "software executes on an Intel 8031 microcontroller 111." (Col. 54, lines 44-45) Dr. Levesque did not deny that the specification so described the CCUs, but said there was no "technical" reason or justification for including that within the proposed construction:

> Q. Dr. Levesque, Ericsson has requested that this Court insert the phrase "including a microcontroller and associated software" into the means for determining synchronization. From the standpoint of one skilled in the art, would you

---

[27] Table 2 is not reproduced here because, as the specification explains, it illustrates the symbol structure for the 4-ary voice channel which is similar to that of the 16-ary voice channel illustrated in Table 3:

> Table 2 shows the symbol structure for the 4-ary voice channel. The structure is very similar to that of the 16-ary voice channel. Differences exist because certain allocations of symbols are dependent on a fixed number of symbols required per slot for overhead purposes, where other bit allocations are made on a fixed number of bits.

(Col. 20, lines 16-23)

> please tell the Court whether there is any technical reason or justification to do that?
>
> A. No. I don't see that this is justified. Once again, it appears to be reading in some of the structure from the preferred embodiment.

Transcript at 193. Once again, although there may be no "technical" reason or justification for doing, there may very well be a legal reason and justification for doing so.

But here there is not. Once the Court identifies the "corresponding structure" described in the specification for performing the function in a means-plus-function claim element, the Court is not required to go further and, in essence, repeat what the specification says about that "structure." There may, of course, be instances in which the parties disagree over whether a disclosed "structure" includes this or that part or piece. In such an instance, it would be appropriate for the Court to resolve that dispute. But here there is no discernible dispute that the CCUs are disclosed as having a microcontroller that operates under software control. Accordingly, it is sufficient for the Court to identify the CCUs as part of the "corresponding structure" without going further and describing the various parts and pieces of the CCUs. Those parts and pieces are adequately described in the specification.

The same holds true for the accompanying software. Although InterDigital disputes whether the disclosed software controlling the operation of the CCUs is part of the "corresponding structure," that issue was resolved by the Federal Circuit *inter alia* in *WMS Gaming* and was resolved here as discussed at length above. The accompanying software is part of the "corresponding structure." However, software may perform a variety of functions, *i.e.*, functions in addition to those recited in a specific claim element. Here, the function recited in the claim is "to determine synchronization between the base station and the subscriber stations." Accordingly, the software described in the specification for performing that function is part of the "corresponding structure." In the absence of a genuine dispute between the parties over whether some portion of the disclosed software actually performs that function, the Court is not required to go any further by, for example, describing the software. Once again, that is the purpose of the specification.

There is thus no reason to add to the construction of this claim element Ericsson's description of what the software does, namely that the "associated software * * * generates a bidirectionally exchanged 12-bit code word within every time slot of the transmit bit stream and processes the code

for error correction and detection to determine synchronization." Nevertheless, in order to resolve any potential dispute over the matter, the specification, as discussed above, discloses that "[c]ode words are used to exchange the current state of the connection, link quality and power and timing adjustments." From the specification, it is clear that the "exchange" of information is between the base station and the subscriber stations, *i.e.*, it is going both directions. The specification does not use the term "bidirectional," but that is an accurate characterization of what is described.

In answer to a question that characterized Ericsson's position as attempting to insert "bidirectional" into the claim:

> Q. (By Ms. Addison) Dr. Levesque, Ericsson is also proposing inserting the word "bidirectionally" before the word "exchanging." Do you, as one skilled in the art, see any technical reason or justification for this Court to make such a modification to this language?
>
> A. No. I don't see any reason for putting that language in there. I don't have any particular technical objection to that – to that concept being talked about, but I don't see any justification for limiting the claim this way.

Transcript at 196, Dr. Levesque answered that he saw no technical reason or justification for doing so. Once again, though, when a party proposes a particular explanation for a claim, that explanation may use, and frequently does use, words that do not appear in the claim. Doing so is not a vice or evil conduct, and does not condemn the perpetrator to be painfully branded as one who attempted a deplorable act unmentionable in polite patent society, *i.e.*, rewriting the claims. Here, in context, "bidirectional" is used as part of the explanation of what Ericsson believes the disclosed software actually does.

Moreover, Dr. Levesque agreed that the word "exchange" implied some kind of transaction going both directions, and did not express much concern about the term:

> Q. Is the exchanging the current state of the connection clear without the insertion of the word bidirectional?
>
> A. I think the word exchanged implies some kind of a transaction going in both directions. I don't think it creates any different meaning by adding the word bidirectional.

Transcript at 196-97.

Ericsson's proposed claim construction also states that the "associated software" generates a "12-bit code word within every time slot of the transmit bit stream and processes the code for error correction and detection to determine synchronization." The specification explains that:

> Code word detection is performed for every slot. The microcontroller 111 performs this task by copying the code word byte into the local RAM and comparing it to a list of valid code words. During each slot the modem 19, 30a provides a fractional symbol offset and an AGC value. These are read by the microcontroller 111 and interpreted appropriately. If power or ranging problems exist, the subscriber station is informed of this via the transmit code word.

(Col. 53, line 62-Col. 54, line 2) Thus, Ericsson's characterization is consistent with the written description. Once again, though, Dr. Levesque, when asked questions on the premise that Ericsson was actually seeking to insert words into the language of the claims, answered that there was no technical reason for doing so. But Dr. Levesque nevertheless confirmed that in the "preferred embodiment" the "word is inserted in every time slot of the transmit bit stream:"

> Q. If you'll drop down now, Dr. Levesque, to the next line where it references the code. Ericsson has requested that this Court insert the word or clause bit" before "code" and then add the words "word within every time slot of the transmit bit stream." In other words, so that a code becomes – "a 12-bit code word within every time slot of the transmit bit stream."
>
> Would you tell the Court, please, whether to one skilled in the art there is any reason or technical justification for doing that with this claim?
>
> A. No. I don't believe there's any technical justification for this. The 12-bit code word is the specific example that was described in detail in the preferred embodiment in the patent, but the claim was originally written to refer to a code in general without being specific about the parameters of the code.
>
> Q. Is there any technical reason or justification that you can determine from the claim or specification or prosecution history to put that within every time slot of the transmit bit stream in here?
>
> A. No. Once again, this is details that come out of the preferred embodiment where, in fact, the word is inserted in every time slot of the transmit bit stream. But following the original claim language, I don't see any technical justification for doing that. And there may very well be system considerations that might guide the designer in a different direction as to the frequency of using – inserting and using code words. [Emphasis added.]

Transcript at 194-195. Thus, there appears to be little doubt that in the "preferred" – and only – embodiment described in the specification, the software that performs the claimed function does in

fact generate a "12-bit code word within every time slot of the transmit bit stream and processes the code for error correction and detection to determine synchronization."

But, once again, on the current record that does not appear to be disputed. Accordingly, although Ericsson's description of what the software does appears to be accurate, it also does not appear to be in dispute. There is no necessity, therefore, to add that description to the identification of the "corresponding structure."

B. Recommendation

In light of the foregoing, the special master recommends that the Court adopt the following:

> In the last element of claim 1 of the '705 patent, the stated function of the "means" is "to determine synchronization between the base station and the subscriber stations" According to the claim, that function requires use of "a code for exchanging the current state of the connection therebetween, the link quality and the power and timing adjustments." The "corresponding structure" disclosed in the specification for performing the claimed function consists of CCUs 18 and 29, RPU 20, STU 27, a 12-bit code word and related software for performing that claimed function.[28]

Under the terms of § 112(6), the claims should therefore be construed to cover that corresponding structure and equivalents thereof.

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[28] InterDigital has filed comments to the draft report and recommendation urging that "12-bit" be deleted, *i.e.*, that the corresponding structure be described as simply a "code word" rather than a "12-bit code word." InterDigital's Comments at 3 *et seq.* InterDigital argues that the codes and code words described in the specification may be a "12-bit code word," "a ten bit code" or a generic code or code word. *Id.* at 5. InterDigital's arguments have been considered, but are, it is believed, adequately addressed in the report and recommendation. The specification simply does not support InterDigital's interpretation. It is true, of course, as InterDigital notes, that the specification refers to a "ten-bit code" in the description of the "Hamming code" and uses the phrase "code word" several times. It is also true that the "function" recited in the claim is to determine synchronization, but the claim also limits that function to using "a code for exchanging * * *." The specification plainly explains that a 12-bit code word is used to determine synchronization between the subscriber and base station, as discussed above. Although other "codes" or "code words" are discussed in the specification, the fact remains that in the sole disclosed embodiment of the invention, the "corresponding structure" described for performing the claimed function includes, not just any "code word," but a "12-bit code word." InterDigital, or its predecessor-in-interest, could have, perhaps, drafted the specification differently or chosen not to use claims that would be construed under § 112(6). Now, however, InterDigital must simply live with the specification and claims as they stand.

VI.
The '358 Patent

A. "toll quality"

1. The Claims

The focus now shifts to claims 9 and 11 of the '358 patent. The disputed term is "toll quality" which appears only in the preambles of both claims as follows, with emphasis added:

> 9. A base station system for providing toll quality digital wireless multiple access terrestrial communication between telephone lines and subscriber stations * * *:
>
> 11. A subscriber station for providing toll quality digital wireless multiple access terrestrial communication between telephone lines and a base station * * *

The term "toll quality" does not appear in the specification of the '358 patent, and was added to the claims during prosecution in 1996, as explained more fully below. Also as discussed below, apparently the file history for the '358 patent in the PTO is in somewhat of a disarray which has lead to an evidentiary issue that is likewise discussed below. Accordingly, resolution of what "toll quality" means has some necessary ingredients of uncertainty.

2. The Parties' Proposed Constructions

The parties' respective positions on this issue are presented through their respective proposed orders:

InterDigital's Proposed Construction	Ericsson's Proposed Construction
The communication is toll quality, which means that the quality of the communication is similar in quality to telephone service in the United States.	Toll quality means a voice signal with the quality equivalent to that provided by a 64 kbps μ-law companded PCM signal transmission. It requires a Mean Opinion Score of at least 4.

InterDigital, however, proposes yet a further and slightly different construction in its post-hearing brief, namely that "toll quality speech should be defined in a pragmatic manner:"

> [T]he output speech would be substantially similar to input analog speech, would therefore give you something that people were used to experiencing in the existing traditional wired telephone network.

InterDigital's Post-Hearing Brief at 16.

3. The Specification and Prosecution History

InterDigital, while acknowledging that "toll quality" is not defined in the specification, says that "evidence of a definition from the prosecution history [of the '358 patent] was excluded at the *Markman* hearing." *Id.* Actually, that is not entirely accurate. Indeed, the "evidence" was excluded *inter alia* because it was uncertain whether the document was actually "from the prosecution history."

A certified copy of the file history for the '358 patent was admitted into evidence. Transcript at 280. According to counsel's representations during the *Markman* hearing, both parties had obtained certified copies of the '358 file history which were almost the same, but not completely the same. Transcript at 267. Neither of those certified copies, apparently, contained the disputed document, at least in the form of exhibit IDC Ex. 93, now InterDigital's Offer of Proof No. 2.

Also, apparently, the disputed document had been the topic of a deposition taken in July, 1999, transcript at 273, but counsel could not verify that the actual document discussed with the witness was a complete document. Transcript at 274-75. In any event, InterDigital was aware for a number of months preceding the *Markman* hearing that there *may* be a problem with the certified file history. It would seem that upon realizing that the official certified file history obtained from the PTO was missing a document that InterDigital considered important that the appropriate thing to do would be to promptly obtain a new certified file history from the PTO with the previously missing document included – assuming, of course, that the document was truly and properly part of the actual file history, a fact that has yet to be established.

InterDigital did not do so, however. Rather, InterDigital evidently did nothing until shortly before the *Markman* hearing when it discovered that the document that was part of the witness' deposition was missing some pages. InterDigital then sent its agent to the PTO to inspect the file. It seems that because the file has been the subject of litigation for a number of years, the file is, as counsel characterized it, in "shambles" and "a mess" (transcript at 275-76) physically contained in six boxes. Transcript at 267. InterDigital's agent, as far as is known, found the subject document in one of those boxes. *Id.*

The obvious problem, of course, is that simply because a paper or a document is found in one of several boxes containing other papers related to a patent, that does not make the paper or document part of the official file history of the patent. Here, both parties had obtained actual certi-

fied file histories that did *not* contain the subject document. At least as of the time of the *Markman* hearing, it was not possible to determine with certainty whether the subject document *should* have been included in the official certified file history, i.e, the possibility exists that the existing certified file histories are actually correct and that the subject document is not properly part of that file history. As discussed during the *Markman* hearing,[29] the face of the document itself leaves doubt that it was, in fact, part of the official prosecution history of the '358 patent. Transcript at 570-573. Moreover, although InterDigital presented a copy of the subject document with a certification by the PTO, that certification did not state that the document was officially part of the prosecution history for the '358 patent. As a result, the document was considered simply too untrustworthy to be relied upon.

The actual certified prosecution history for the '358 patent reveals that there was an interview between InterDigital's patent attorney and the examiner on July 1, 1996. The Examiner Interview Summary Record contains the somewhat cryptic comment that "[t]he 'toll quality' feature was discussed as being a potential distinguishing feature." (Paper No. 41) Where that "toll quality feature" first originated outside of that interview, and why, is not evident from the record. Also, the file reveals that other subsequent examiner interviews occurred shortly thereafter on July 9, 1996 (Paper No. 42) and July 18, 1996 (Paper No. 43), but there is no mention of "toll quality." InterDigital then presented a lengthy amendment that cancelled pending claims 127-203, and added claims 204-252. (Paper No. 44) The claims maturing as patent claims 9 and 11 were presented in that group of new claims. Most, but not all, of the new independent claims presented in that amendment included "toll quality" in their preambles. After further supplemental amendments, the PTO issued a Notice of Allowability indicating that claims 204-220 and 223-268 were allowable. None of that, unfortunately, provides even the vaguest clue as to what was intended by "toll quality" or why adding that phrase to the claim preambles distinguished the claims over the prior art, or even if it did.

[29] The hearing on this issue appears at pages 266-285 and 568-573 of the transcript.

4. Testimony During *Markman* Hearing

Thus, the Court is left with the competing, naturally, opinions expressed by the expert witnesses proffered by the parties. As a result, the testimony by the parties' respective experts is set forth below, sadly, at length.

On behalf of InterDigital, Dr. Jayant testified that although the term could be used in different contexts, to him it meant that the "output or resulting speech signal would be a high quality replica of the original signal carrying substantially the same information as the original signal:"

> Q. Yes. Did you have an opportunity in the early 1980s to use the word "toll quality" and become accustomed to its meaning, if any?
>
> A. Yes.
>
> Q. In using that term in the early 1980's, could you tell the Court what in your opinion or in the opinion of one of ordinary skill in the art the term meant? Maybe that's two different questions. So let's start with you personally, in your experience using that term in the 1980's – early 1980's.
>
> A. First of all, the word "toll quality" can be used in different contexts. But to me in the context of speech compression, it meant a compression decompression system in which the output or resulting speech signal would be a high quality replica of the original signal carrying substantially the same information as the original signal. And in that sense, it also got equated to quality of the highly, well-designed wired network for telephony where there would be very little distinction in terms of the user perception between let us say an analog signal that came in at one part of the link and the compressed digital version that was reproduced at the other end of the link.
>
> Q. Was toll quality, focusing again or early 1980's, a term that was easy to define?
>
> A. It was not easy to define it in an unambiguous straightforward manner. There were many fairly accepted definitions of it at the time but not one definitive totally unambiguous definition in a qualitative sense.

Transcript at 493-495. On re-direct examination, Dr. Jayant also explained that "pragmatically" that meant that one of ordinary skill in the art, at the end of the day, would be looking for "output speech would be substantially similar to the input analog speech, would therefore give you something that people were used to experiencing in the existing traditional wired telephone network:"

> Q. Now, what I want you to do is explain what that definition, that pragmatic definition has to do or the relationship between that and your definition of the expertise of one of ordinary skill in the art as you defined it earlier today.

A. I'll try. I think earlier today I was talking about one skilled in the art, ordinary skill in the art, in this particular context as one who had, among other things, the responsibility for integrating a complete communication system. Integrating a complete communication system with many subsystems that will include a speech compression part, a modem part, an RF part, and implementation part and so on.

So, in the time context that we have here and in the eyes of such a person, the pragmatic definition would mean that regardless of how much they're exposed to mathematical or elegant ways of measuring speech quality, first and foremost they would look for a qualitative guarantee that the system they were integrating or building had the pragmatic criteria that it met; namely, at the end of the system at the end of the day the output speech would be substantially similar to the input analog speech, would therefore give you something that people were used to experiencing in the existing traditional wired telephone network. That's where the pragmatic connection really comes in.

And the kinds of characteristics that I have written about long before I entered this hall include characterizations of things like speaker recognition, intelligibility and a high degree of naturalness.

Transcript at 538.

Dr. Jayant also explained the subjective nature of the MOS test:

Q. Would you tell us what MOS is?

A. MOS stands for mean opinions code. It is a subjective measure of speech quality generally depicted in a five-point scale. Five would be perfect. As the word "mean" indicates, it is a grand average of many, many measurements across many speakers, many speech sentences, many conditions, many orders of presentation of the speech stimuli, so on and so on. All resulted in some mean number which would provide a subjective assessment of speech quality.

* * * * *

Q. Now, let's go back to MOS a minute. I think it would be helpful if you explain how a MOS test is conducted.

A. Yes. As indicated earlier, a MOS test is a subjective test. It's a fairly elaborate operation. Sometimes takes days and sometimes weeks to administer. You ring different subjects, accommodate different speech stimuli, present the subjects in random order so that there is no bias of any kind. Make sure that different kinds of speakers are involved, male and female. Different kinds of speech sounds are involved. And the job that each particular listener has to do again can be less or more involved.

In one scenario, you ask the subject directly to listen to a stimulus and give it a number, quality number, on the scale of 1 to 5. This is easy on the experiment

but more difficult on the subject because he has to make a very fine determination, he or she.

In a somewhat different scenario, you can transfer the load to the experiment and make the experiment longer but make each job easier for the subject by saying, okay, don't give me a number with such fine accuracy. Let me give you two speech stimuli, A and B. Just tell me which is better.

But no matter how you actually implement this MOS test, it is a very complicated test. And at the end of it, you hope to get a number that is repeatable, consistent, and uniform. So, the point I was trying to make is that MOS begins to be a fairly elaborate test. And as the number of parameters affecting speech quality increase, the complexity of the MOS procedure increases more than linearly.

Transcript at 495, 497-99.

Despite those problems with the MOS test, though, Dr. Jayant testified that it was possible, but in his opinion "less practical than it was possible," to use the MOS test for a wireless network:

Q. Now, I want to go back to the period from 1985 through 1995. During that period, was it possible to measure toll quality in spite of everything you've told us using MOS for a wireless network? Was it possible?

A. Theoretically in principle, yes.

Q. Was it practical?

A. I think it was less practical than it was possible.

Q. If you were to conduct such a test during that time period, would you get uniform repeatable consistent results between different people conducting the tests in different places?

A. The repeatable and consistency would be a major issue if you wanted the test to reflect truly the complexity of the situation that you are trying to get your arms around.

Q. So, back then was there any standard methodology for weighing all of these variables that are involved if you were testing it on a wireless network where you had the variables you told us about?

A. Did you say "weighing"?

Q. Yes. Was there a way to weight these different variables so you could come up with one score that would a consistent score?

A. That would be very difficult because different wireless systems and networks have different degrees of acoustic noise and channel noise and what have you. So, coming up with one widely accepted set of weights would be very difficult.

Transcript at 499-500. Earlier, Dr. Jayant had explained why, in his view, the measures used in the MOS test differed between wired and wireless contexts, namely that more parameters affected speech quality in a wireless environment than in a wired environment:

> Q. In your opinion, do those measures and, in fact, the use of MOS work in the wireless context in the same way as in the wired context when you made those statements?
>
> A. They do not. They do not straightforwardly extend to the wireless context.
>
> Q. Would you please explain for the Court why not?
>
> A. Well, one of the reasons is that the wireless context presents many other situations that affect speech quality which are peculiar to wireless context. Examples would be the fact that wireless communications channels are inherently unfriendly because of things like noise and interference and multi-path signal fading. And the effect on the speech compression algorithm is that they introduce bit errors in the bit stream that's carrying the speech information. At other level, again because of things like signal fading, some of these errors occur in bursts or clusters of errors very much like entire packet losses. And they have an effect on speech quality and how it can be measured reliably and repeatedly – repeatably.
>
> Yet another parameter which is somewhat wireless specific is that wireless systems include mobility. When you're walking around when [sic. "with"] this receiver in your hand, you're subjecting your input speech itself to the problems of acoustic environment; a background noise, multi talkers in the background, traffic noise, what have you. So to cut a long story short, there are many, many aspects of wireless networks that make the problem of speech quality measurement much more difficult.

Transcript at 496-97.

Also, over Ericsson's objection and motion to strike, Dr. Jayant reiterated that in his opinion one of ordinary skill in the art during the 1985 through 1995 time period (Transcript at 499) would have used a "more pragmatic definition of toll quality" than that suggested by Ericsson's proposed claim construction:

> Q. (By Mr. Harrell) Let's look at Ericsson's construction which refers to 64 kbps u-law companded PCN signal transmission and a mean opinion score of at least four. And my question to you is: Would one of ordinary skill in the art in the period we've been talking about construe toll quality in that fashion?
>
> SPECIAL MASTER: I'll permit it, Mr. White.
>
> A. In the broadest context that you are talking about, I believe a person of ordinary skill would look for a more pragmatic definition of toll quality.